

consisting of: human, non-human higher order primate, canine, feline, bovine, equine, ovine, porcine and avian.

32 (New). A method of introducing one or more desirable alleles into livestock which contains undesirable alleles by replacing a segment of genomic DNA that has an undesirable allele with a corresponding segment of DNA that has a desirable allele, the method comprising the step of

administering to the livestock an effective amount of a plurality of polynucleotide molecules that are free of vector sequences,

wherein

the plurality of polynucleotide molecules having about 100-3000 nucleotides each and include a polynucleotide molecule which comprises desirable alleles corresponding to the undesirable alleles in the genomic DNA in the livestock, and

wherein

at least some of the plurality of polynucleotide molecules including polynucleotide molecules which comprises the desirable alleles

are taken up by the cell of the livestock which has the undesirable alleles in genomic DNA,

are transported to the nucleus of the cell, and

recombine with the genomic DNA of the cell by homologous recombination

whereby the undesirable alleles of genomic DNA is replaced by the desirable alleles in the genomic DNA.

33 (New). The method of claim 32 wherein the plurality of polynucleotide molecules are administered in an amount of 0.01 – 16 g of polynucleotides having 200-3000 nucleotides each.

34 (New). The method of claim 32 wherein the plurality of polynucleotide molecules are administered in an amount of 0.01 – 16 g of polynucleotides having 200-3000 nucleotides each with an average length of 300 -1000 nucleotides.

35 (New). The method of claim 32 wherein the plurality of polynucleotide molecules are free DNA.

36 (New). The method of claim 32 wherein the plurality of polynucleotide molecules are DNA in complexes with histones, polyamines or synthetic polycations.

37 (New). The method of claim 32 wherein at least 80% of polynucleotide molecule